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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,405	03/18/2004	Yan Liu	42P17834	7372
<div>7590      11/20/2007</div> <div>Anthony H. Azure BLAKELY, SOKOLOFF, TAYLOR &amp; ZAFMAN LLP Seventh Floor 12400 Wilshire Boulevard Los Angeles, CA 90025</div>				
			EXAMINER	
			INGBERG, TODD D	
			ART UNIT	PAPER NUMBER
			2193	
			MAIL DATE	DELIVERY MODE
			11/20/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/804,405

**Applicant(s)**

LIU ET AL.

**Examiner**

Todd Ingberg

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --.

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 3/18/2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

Claims 1 – 27 have been examined.

#### *Drawings*

1. Figure 10 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### *Specification*

2. The abstract of the disclosure is objected to because it is currently two paragraphs. Examiner requests the Abstract be made into one paragraph. Correction is required. See MPEP § 608.01(b).
3. The attempt to incorporate subject matter into this application by reference to URLs in the Specification is ineffective because the Office Policy on URLs is they are not permitted because they are not permanent. Applicant must delete the URLs. Applicant may submit the material in an Information Disclosure Statement.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 27 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The meaning of “*substantially*” has no quantifiable meaning. To “substantially” comply with an Extensible Firmware Interface (EFI) specification has no meaning and had no patentable weight.

***Common Knowledge of Computer Languages***

6. The Examiner has provided portions of a well-known college textbook, on computer languages. “Compilers Principles, Techniques, and Tools” published September 12, 1985, by Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman. One of less than ordinary skill should know the subject matter covered in the text book. Particularly the following sections.

9.4 Basic Blocks and Flow Graphs.

9.8 The DAG Representation of Basic Blocks.

9.10 Generation Code From DAGs.

10.3 Optimization of Basic Blocks.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. Claims 1 – 4, 7, 10-12, 14-15, 18 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Global Compaction of Horizontal Microprograms Based on the Generalized Data Dependency **Graph**”, Sadahiro Isoda et al, 1983 in view of “Compilers Principles, Techniques, and Tools” published September 12, 1985, by Alfred V. **Aho** et al.

#### **Claim 1**

**Graph** teaches firmware optimization with dependency graphs (Graph, Abstract and page 923, section III), a method, comprising: collecting a plurality of module-to-module interfaces (Graph, data dependency graph, pages 923 – 924) from a plurality of firmware modules (Graph, Firmware – Abstract and Graph, Introduction, basic blocks), wherein a module-to-module interface allows a first firmware module of the plurality of firmware modules to invoke a second firmware module of the plurality of firmware modules (Graph, data dependency graph, pages 923 – 924 and page 925 – Table 1 and Aho, page 653-654, 657-659); collecting a plurality of dependency expressions corresponding to the plurality of firmware modules (Graph, page 923-924, Graph representing the program prior to optimization and Aho, pages 331 and 334), wherein each dependency expression of a firmware module describes the module-to-module interfaces needed for execution of the firmware module (Graph, page 923-924, Graph representing the program prior to optimization); and sorting the plurality of firmware modules into an optimized order based on the plurality of dependency expressions (Graph, pages 924 – 925, section IV and page 929 – top of 931 and Aho, page 396 - 398) and the plurality of module-to-module interfaces (Graph, pages 924 – 925, section IV and page 929 – top of 931 and Aho, page 391). **Graph** teaches optimizing firmware based on a dependency graph but **Graph** lacks the teaching of underlying principles and well known techniques of code optimization. It is **Aho** who teach the well established techniques of code optimization. Therefore, it would be obvious to one of ordinary skill at the time of invention to combine the teachings of **Graph** and **Aho**, because optimized code regardless if it in hardware, software or firmware is more efficient.

#### **Claim 2**

The method of claim 1, further comprising computing a directed acycyle graph (DAG) based on the plurality of dependency expressions ( Aho, page 706, DAG ) and the plurality of module to-module interfaces ( Aho, pages 334, 391page 653. Inter procedure Data Flow Analysis), the DAG to be used in sorting the plurality of firmware modules (firmware modules are represented by basic blocks - Prior to Optimization - Graph, data dependency graph, pages 923 – 924 and page 925 – Table 1 and Aho, page 653-654, 657-659).

#### **Claim 3**

The method of claim 1 wherein collecting the plurality of module-to-module interfaces (Aho, page 331, Dependency Graph) comprises collecting metadata from each module-to-module interface (Aho, page 391, call activation tree ) of the plurality of module-to-module interfaces ( Aho, pages 391 and 396), the metadata describing the module-to module interfaces produced by

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the firmware module (Aho, page 331 the lines of the DAG represent metadata and page 394, activation record ).

#### **Claim 4**

The method of claim 1, further comprising generating an error if a firmware module of the plurality of firmware modules includes a dependency expression that refers to a module-to-module interface that is not produced by the plurality of firmware modules (Aho, pages 409 and 442).

#### **Claim 7**

The method of claim 1, further comprising generating a firmware volume (FV) (Prior to Optimization - Graph, data dependency graph, pages 923 – 924 and page 925 – Table 1 and Aho, page 653-654, 657-659) for the computer system, the FV including the sorted plurality of firmware modules. (Optimized - Graph, pages 924 – 925, section IV and page 929 – top of 931 and Aho, page 396 – 398).

#### **Claim 10**

The method of claim 7, further comprising generating an updated FV using an FV update utility See the rejection for claim 1 the before and after optimization.

#### **Claim 11**

**Graph** teaches firmware optimization with dependency graphs, an article of manufacture comprising: a machine-accessible medium including a plurality of instructions which when executed perform operations comprising: starting a firmware volume build tool to generate a firmware volume (FV) for a computer system ( See the rejection for claim 1 and claim 7 – Aho, compiler's intended use is to build volumes); collecting a dependency expression from each of a plurality of firmware modules; collecting metadata associated with each of the plurality of firmware modules, the metadata describing the module-to-module interfaces produced by each of the plurality of firmware modules; sorting the plurality of firmware modules into an optimized order based on the dependency expressions and the metadata; and generating the FV, wherein the FV includes the plurality of firmware modules sorted in the optimized order. See the rejection for claim 1. **Graph** teaches optimizing firmware based on a dependency graph but **Graph** lacks the teaching of underlying principles and well known techniques of code optimization. It is **Aho** who teach the well established techniques of code optimization. Therefore, it would be obvious to one of ordinary skill at the time of invention to combine the teachings of **Graph** and **Aho**, because optimized code regardless if it in hardware, software or firmware is more efficient.

#### **Claim 12**

The article of manufacture of claim 11 wherein execution of the plurality of instructions further perform operations comprising computing a directed acycle graph (DAG) based on the dependency expressions and the metadata , the DAG to be used in sorting the plurality of firmware modules. See the rejections for claims 1 and 2.

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**Claim 14**

The article of manufacture of claim 11 wherein execution of the plurality of instructions further perform operations comprising generating an error signal if the module-to-module interface of a dependency expression is not described in the metadata associated with each firmware module of the plurality of firmware modules. (Aho, pages 409 and 442).

**Claim 15**

The article of manufacture of claim 11 wherein execution of the plurality of instructions further perform operations comprising removing the metadata from each firmware module of the plurality of firmware modules. (Aho, code motion, page 739).

**Claim 18**

**Graph** teaches firmware optimization with dependency graphs a computer system, comprising: a processor; and a magnetic storage device operatively coupled to the processor, the magnetic storage device including instructions which when executed by the processor perform operations comprising: collecting a dependency expression from each of a plurality of firmware modules ; collecting a metadata from each of the plurality of firmware modules , the metadata describing module-to-module interfaces produced by a firmware module of the plurality of firmware modules ; sorting the plurality of firmware modules into an optimized order based on the dependency expressions and the metadata (See the rejection for claim 1); and generating a firmware volume (FV) that includes the plurality of firmware modules sorted in the optimized order (Aho, pages 558 – 561, Rearranging the Order and Optimal Ordering for the Tree ). **Graph** teaches optimizing firmware based on a dependency graph but **Graph** lacks the teaching of underlying principles and well known techniques of code optimization. It is **Aho** who teach the well established techniques of code optimization. Therefore, it would be obvious to one of ordinary skill at the time of invention to combine the teachings of **Graph** and **Aho**, because optimized code regardless if it in hardware, software or firmware is more efficient.

**Claim 22**

**Graph** teaches firmware optimization with dependency graphs, a system, comprising: data which encodes a set of firmware modules in a predetermined order (Aho, sections 9.4, 9.8 and 9.10 - A predetermined order is inherent. The program in it's original form when compiled inherently has the order of the program prior to optimization), the predetermined order defined according to: a dependency expression associated with each firmware module of the set of firmware modules (Aho, the DAG to Basic Blocks as per sections 9.8 and 9.10); and metadata associated with each firmware module, the metadata describing module-to-module interfaces produced by each firmware module ; and code which executes the set of firmware modules according to the predetermined order See the rejection for claim 1. (Note – predetermined order in the broadest interpretation is the order without optimization). **Graph** teaches optimizing firmware based on a dependency graph but **Graph** lacks the teaching of underlying principles and well known techniques of code optimization. It is **Aho** who teach the well established techniques of code optimization. Therefore, it would be obvious to one of ordinary skill at the time of invention to combine the teachings of **Graph** and **Aho**, because optimized code regardless if it in hardware, software or firmware is more efficient.

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9. Claims 5-6, 8, 9, 13, 16 – 17, 19, 21 and 23 - 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Graph and Aho as applied to claims 1 – 4 and 7 above, and further in view of EFI Specification 1.02 released by Intel on December 12, 2000 as documented by Wikipedia (EFI, bottom of first page).

**NOTE**

EFI as documented on Wikipedia is considered prior art under *In re Epstein* 31 USPQ2d 1817 (decided August 17, 1994).

**Motivation to Combine**

One of ordinary skill in the art at the time of invention would have known to employ the teachings of Graph and Aho in the effort to optimize firmware and to implement Extensible Firmware Interface, because EFI provides an interface to the operating system including the BIOS.

**Claim 5**

The method of claim 1 wherein the plurality of firmware modules comprise a plurality of Pre-EFI (Extensible Firmware Interface) (EFI, page 1) Initialization Modules (PEIMs) (Aho, Note the terms of applicant are different but the meaning is the same as terms of the art in Aho, see pages 391, 396-398 and page 418 – procedure parameters).

**Claim 6**

The method of claim 5 wherein the plurality of module-to-module interfaces comprise a plurality of PEIM-to-PEIM Interfaces (PPIs) See the rejection for claim 5.

**Claim 8**

The method of claim 7, further comprising storing the FV in a non-volatile storage device of the computer system ( As per claim 7 and EFI, page 1 , BIOS).

**Claim 9**

The method of claim 7 wherein the FV to operate in accordance with an Extensible Firmware Interface (EFI) specification. (EFI, page 1).

**Claim 13**

The article of manufacture of claim 11 wherein execution of the plurality of instructions further perform operations comprising storing the FV in a non-volatile storage device of the computer system. See the rejection for claim 8.



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**Claim 16**

The article of manufacture of claim 11 wherein the FV to operate in accordance with an Extensible Firmware Interface (EFI) specification. See the rejection for claim 8.

**Claim 17**

The article of manufacture of claim 11 wherein the plurality of firmware modules includes a plurality of Pre-ER (Extensible Firmware Interface) Initialization Modules (PEIMs) and the module-to-module interfaces include PEIM-to-PEIM Interfaces (PPIs).  
See the rejection for claim 5.

**Claim 19**

The computer system of claim 18, further comprising a non-volatile storage device operatively coupled to the processor to store the FV. See the rejection for claim 8.

**Claim 21**

The computer system of claim 18 wherein the plurality of firmware modules includes a plurality of Pre-EFI (Extensible Firmware Interface) Initialization Modules (PEIMs) and the module-to-module interfaces include PEIM-to-PEIM Interfaces (PPIs).  
See the rejection for claim 5.

**Claim 23**

The system of claim 22 wherein the data which encodes the set of firmware modules includes a firmware volume ( Deemed inherent for configuration management and for compliance with the versions of EFI).

**Claim 24**

The system of claim 22 wherein the code is executed during a pre-boot phase of a computer system (EFI, page 1, BIOS).

**Claim 25**

The system of claim 22 wherein the code which executes the set of firmware modules includes a PEI foundation module ( EFI, page 1, UEFI ).

**Claim 26**

The system of claim 22 wherein the set of firmware modules includes a plurality of Pre-EFI (Extensible Firmware Interface) Initialization Modules (PEIMs) and the module-to-module interfaces include PEIM-to-PEIM Interfaces (PPIs).  
See the rejection for claim 5.

**Claim 27**

The system of claim 22 wherein the data and the code substantially comply with an Extensible Firmware Interface (EFI) specification.  
See the rejection for claim 9.

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10. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Graph and Aho as applied to claims 1 – 4, 7 and 10 above, and further in view of Downloading new versions of firmware as taught by HP OpenView, A Guide to Hewlett-Packard's Network and System Management Platform, Nathan Muller, 1995.

**Claim 20**

The computer system of claim 18, further comprising a network interface operatively coupled to the processor to receive at least one firmware module of the plurality of firmware modules( HP, page 256). Graph and Aho teach generating and optimizing firmware and HP teaches downloading new versions. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to know to update firmware because, it makes systems more reliable.

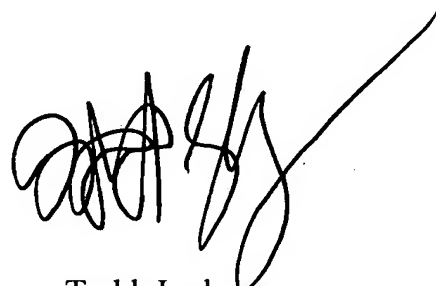
***Correspondence Information***

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Todd Ingberg whose telephone number is (571) 272-3723. The examiner can normally be reached on during the work week..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to read 'Todd Ingberg', with a long, sweeping horizontal line extending to the right.

Todd Ingberg  
Primary Examiner  
Art Unit 2193

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